GUAYULE INSECT INVESTIGATIONS, SEASON 1943

By T. P. Cassidy

As a result of serious insect injury experienced in connection with the guayule program during 1942, the Emergency Rubber Project requested the Bureau of Entomology and Plant Quarantine to assign entomologists to the Project for investigating and developing or adapting control measures for any insect found to be injurious to the plant or the rubber content. Four entomologists were assigned and stationed at Los Angeles, Salinas and El Paso.

The Entomology Division is a research and service organization. Any entomological problem, whether directly or indirectly connected with guayule, is turned over to the entomologists for advice and control. For example, during the past season it was necessary to fumigate a number of barracks at labor camps for bedbugs and lice, fumigate kitchens for cockroaches, exterminate ants around kitchens and barracks, fumigate blankets infested with bedbugs and give advice on how to store blankets during the summer months to protect them from moths, et cetera. While these are minor miscellaneous services, it is felt that they are necessary in connection with progress of the Project.

During the past year a number of important insect problems developed in the nurseries, greenhouses, and field plantings, but in most cases satisfactory control measures were devised. This was due partly to the excellent cooperation obtained from the Forest Service in promptly carrying out recommended control programs, and to helpful advice given by the Bureau of Plant Industry and State and Federal entomologists from their experiences, thus obviating in many cases long time experiments.

The most common insect injury noted the past year was from grasshoppers, lygus, ants, lacebugs, termites, diabrotica beetles, woolly bear caterpillars, aphids, thrips, red spiders, false chinch bugs, wireworms and white flies. There are many other species of insects found on guayule, some of which are undoubtedly causing injury to the plant. Some of the species are more injurious to nurseries, some to greenhouse plants, while others are more injurious to field plantings. However, should we go to direct field planting it will undoubtedly increase our field insect problems.

At the present time we feel that Lygus is probably one of our most injurious species that attack plantation guayule on account of its wide distribution. It was demonstrated the past season that Lygus retards growth, reduces seed yield and seed viability. Since this insect has been found in all guayule plantings extending from northern California to the lower Rio Grande Valley of Texas we feel that it is an important guayule insect. We have prepared a paper on the work done on Lygus the past season which will be discussed by Mr. Romney

There were a few species of insects found to attack field planted guayule in Texas that do not occur in Arizona and California. Then too lacebugs seem to be more injurious in Texas than in Arizona and California. Should the guayule production plantings be extended to Arizona, New Mexico and Texas we will undoubtedly have new insect problems to deal with. Mr. Buchanan has prepared a paper on some of the injurious insects found in Texas and New Mexico the past season.

Thrips, white flies and red spiders are found on guayule in practically all stages of growth, but the greatest injury noted from their feeding the past season was on small seedling plants in nurseries and greenhouses. Mr. York has prepared a paper for this meeting on the control work done on these insects here at Salinas the past season.

Since we had several other insect problems that are not included in papers to be read at this meeting, I believe it will be of interest to the group here to give a brief resume of a few of the more important ones.

Grasshoppers threatened to be one of the most destructive insects to field planted guayule the past season, and it seems that we will have to plan for its control in some areas every year since there are a number of guayule plantings vulnerable to grasshopper attack. During the past season it was necessary to apply approximately 177,000 pounds of wet grasshopper bait for the protection of guayule in the Arbuckle, Bakersfield and Patterson districts. Grasshoppers breed in enormous numbers in range and pasture lands, alfalfa fields, ditch banks, roadways, et cetera, and migrate to guayule and other crops. It is important that heavy populations be located in their breeding grounds and baited while in their nymphal stages before they migrate to guayule fields. Our control program the past year was conducted in cooperation with the Division of Grasshopper Control of the Bureau of Entomology and Plant Quarantine. In the late winter and spring they assigned two inspectors to make grasshopper egg surveys in areas contiguous to the major guayule plantings. These surveys gave an indication as to where hoppers would appear in sufficient numbers to migrate to guayule. Then the most vulnerable areas were again surveyed in the late spring and early summer for nymphs so control measures could be started as soon as the hoppers began to move into guayule fields. The most serious infestation was in the Bakersfield district where 4000 acres of guayule borders an alfalfa pasture land for a distance of four and one-half miles. However, the hoppers were held in check without the loss of any guayule. While literally millions of hoppers were killed we expect trouble here again another year. The Division of Grasshopper Control will cooperate with us again the coming season and have inspectors in the field, but each District Supervisor should assist them by reporting any heavy concentrations of grasshoppers that may be found near guayule plantings. You may be interested in the type of injury caused to guayule by grasshoppers (Slide 1).

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Three species of ants have caused injury to field planted guayule, namely, the California fire ant, harvester ant, and Texas leaf cutting ant. The California fire ant is a small ant with a red head and thorax and black abdomen. It barks the roots of guayule and causes the plants to die (Slide 2). While no serious losses have been experienced from this ant it seems to be widely distributed in California. Dead plants from its attack have been noted in the Colusa, Bakersfield and southern California districts. This ant has been effectively controlled by the use of methyl bromide. The harvester ant is a large reddish ant found generally distributed from California to Texas. It has been most destructive in nurseries where it steals planted seed and destroys seedling plants around the nests. The greatest damage experienced in plantation guayule has been from its seed collecting habit. However, if direct seeding becomes a practice it will destroy stands where it occurs and should be controlled. It has been effectively controlled with carbon bisulfide, methyl bromide and poisoned baits. The Texas leaf cutting ant has been destructive to experimental guayule plantings in West Texas east of the Pecos River. It makes large nests and defoliates plants for long distances around the nests. The plants defoliated die in most cases, thus destroying the stand. This ant has been effectively controlled by the use of methyl bromide.

Wireworms are primarily a nursery pest. They were found in five nurseries the past season, but did not cause serious damage except in one. In April, 15% of the plants in the lower half of the San Mateo nursery were found to be dead or seriously injured by worms. This section of the nursery had been planted the previous winter. The nursery stock was lifted in May and the area was reseeded in early June. Study areas were selected and seasonal records kept of injured plants. Less than one percent of the plants were injured by worms. The only explanation we can give for this is that the worms go down in the soil during the summer months to get away from the heat. Another section of the nursery was fallowed during the summer and planted in early September. To the present time no injury has occurred in this area. While we have adapted satisfactory control measures in the nurseries for wireworms by the use of naphthalene and beta-beta-dichloroethyl ether, the treatments are expensive. Basing our conclusions on the past year's experience we believe serious wireworm injury can be avoided by planting the worm infested areas during the summer months, especially in the warmer climates such as southern California.

Several species of diabrotica beetles occur in the Southwest where guayule is grown. The one that has caused most damage is the eleven spotted diabrotica beetle. This is a small bright-green beetle, about 6 mm. long with 11 black spots on the elytra. The beetles usually migrate into the fields or nurseries suddenly and feed for several days, and then move out. The most noticeable effect of the feeding is the many holes in the leaves which does not appear to be injurious to the plants

after they become four or more inches high. The damage experienced has been in the cotyledon stage in the nurseries and the direct field planted guayule. The beetles eat the cotyledon and terminal buds causing the plants to die in most cases. With the present method of transplanting guayule in the field it is believed this beetle will not be injurious to field plantings, but if direct seeding becomes a general practice it will undoubtedly become a serious pest in many sections. Experiments conducted the past season indicate that it can be satisfactorily controlled by the use of either calcium arsenate or cryolite.

Several species of darkling ground beetles occur in the Southwest. It is primarily a nursery pest but was found to injure field transplanted guayule in Arizona the past season. If direct seeding in the fields becomes a common practice this insect will undoubtedly be a major pest in some areas. It was effectively controlled the past season with sweetened poisoned bran mash. It was necessary to treat 3,648 beds or 202 acres in the Mission nursery the past season.

Woolly bear caterpillars are rather general feeders but it is believed that they will not become injurious to transplanted field guayule. They are primarily a nursery pest but will undoubtedly become a problem to direct field planted guayule. Populations can be reduced with arsenicals but a satisfactory control measure for seedling guayule has not been worked out. These caterpillars are very hairy and gray in the immature stages, and black with yellow broken lines and cinnamon red hairs on the sides. They sometimes become 10 to 50 mm. in length.

Several species of aphids occur on guayule but serious injury to field planted guayule has not been experienced. The greatest injury has been noted in the nurseries and greenhouses. However, they will undoubtedly cause the same type of injury to direct field planted guayule. They can be controlled with nicotine sulfate.

The false chinch bug is a small sucking insect that causes most of its damage in the nymphal stage. The small nymphs cover the leaf surface and terminals for extracting the juice similar to aphids. They breed in the late winter and spring on a number of host plants, but their favorite host seems to be wild mustard. They reach the adult stage in late May and early June and do not cause further damage. Some damage was experienced on limited acreage the past season in fields that were allowed to become foul with wild mustard and other weeds on account of the labor shortage. Where the fields were chopped in late May the nymphs transferred to guayule. On about two acres in one field 80 to 90 percent of the stand was destroyed and the plants that lived were badly stunted (Slide 3). Satisfactory control measures with insecticides have not been developed. Weeds, especially wild mustard, that are infested with false chinch bugs should not be chopped until around the middle of June, after

the insects have reached the adult stage. It is believed that this will eliminate injury to guayule.

The stem borer, Agromyza virens, has caused much concern on account of its wide distribution in nursery stock. Infested plants have been found in all nurseries in California except in the Bakersfield district where systematic inspections have not been made for it. The San Mateo nursery has shown the heaviest infestation of any of the nurseries. On August 12, 38% of all plants in the nursery were bored. The injury is caused by the larvae of a small fly. The eggs are deposited in limb crotches and when they hatch the small larvae burrow into the plant and eat a small tunnel in the pith of the main stem. The tunnels usually extend down the main stem to the end of the pith. Before pupation the larvae in most cases work back up the tunneled pith an inch or so where they bore an exit hole to the outside of the stem through which the adult flies emerge. Many bored plants do not show obvious injury, but in some instances the main stems wilt and die back. The survival and growth of 350 bored plants were compared with a similar number of uninfested plants in a replicated experiment the past season. This experiment showed a 64% survival for the bored plants compared to 77% for the uninfested plants, but there was no difference in their growth. Information to date indicates that it would be undesirable to cull nursery stock bored by larvae of Agromyza virens.